

Abstract

A method and apparatus for increasing the capacity of a system that use four transmit antennas and that employs conventional channel coding by performing space-time coding in a particular way. Each of two pairs of symbol sub-streams is space-time coded to form a respective pair of transmit-sequence chains, where at least one of the formed pairs of the transmit-sequence chains is a function of symbols of the respective symbol-sub-stream pair and not a function of the symbols of the other symbol-sub-stream pair. Four transmit sequences—two transmit sequences from each of the two pairs of symbol sub-streams—may be viewed as forming a transmission matrices **B** or **B'** arranged as follows:

$$\begin{array}{c}
 \begin{array}{c} T_1 \quad T_2 \quad T_3 \quad T_4 \\
 \text{Antenna 105-1} \begin{bmatrix} b_1 & b_1 & -b_2^* & -b_2^* \end{bmatrix} \\
 \text{Antenna 105-2} \begin{bmatrix} b_2 & b_2 & b_1^* & b_1^* \end{bmatrix} \\
 \text{Antenna 105-3} \begin{bmatrix} b_3 & -b_3 & -b_4^* & b_4^* \end{bmatrix} \\
 \text{Antenna 105-4} \begin{bmatrix} b_4 & -b_4 & b_3^* & -b_3^* \end{bmatrix}
 \end{array}
 \quad \text{or,} \quad
 \begin{array}{c}
 \begin{array}{c} T_1 \quad T_2 \quad T_3 \quad T_4 \\
 \text{Antenna 105-1} \begin{bmatrix} b_1 & -b_2^* & 0 & 0 \end{bmatrix} \\
 \text{Antenna 105-2} \begin{bmatrix} b_2 & b_1^* & 0 & 0 \end{bmatrix} \\
 \text{Antenna 105-3} \begin{bmatrix} 0 & 0 & b_3 & -b_4^* \end{bmatrix} \\
 \text{Antenna 105-4} \begin{bmatrix} 0 & 0 & b_4 & b_3^* \end{bmatrix}
 \end{array}
 \end{array}
 \end{array}$$

respectively, where b_1 , b_2 , b_3 , and b_4 are the symbols derived from a respective one of four symbol sub-streams, and b_1^* , b_2^* , b_3^* , and b_4^* are, respectively, the complex conjugate of the aforementioned symbols. The rows of the matrix represent the different antennas, while the columns represent different symbol periods.